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COMPUTATIONAL MECHANICS IN PEDIATRIC MEDICINE: AN OVERVIEW

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ABSTRACT

From foetuses, to newborns, to children and adolescents there is a large number of pediatric patients in need of computational strategies to improve the treatment of their conditions. In fact, the pediatric age is characterized by very rapid and sudden changes, which make it extremely difficult to test standardized paradigms of care. In turn, this makes pediatric treatments highly personalized, especially when it comes to surgeries and prosthetics. While on the one hand there is the difficulty of conducting wide clinical trials on large patient populations for each stage of growth and development, especially when it comes to rare congenital disease; on the other hand there is the need to treat these conditions as soon as possible, sometimes even in the womb, to ensure a good quality of life in these subjects. The growing use of computational mechanics as patient-specific predictive tools for adult treatments has spurred interest in engineers, researchers and physicians for the use of computational methods in predicting the outcome of highly personalized pediatric treatments, for which the need of prognostic tools is high and vital. The translation of established computational methods used in adults to pediatric patients has its own challenges, from the lack of high-quality images, as children are often spared CT-scans and X-rays, to the need of an accurate predictions in very rapid times. In this minisymposium we aim to explore the state of the art of this novel, interdisciplinary area of application of computational mechanics, continuing the success of a similar minisymposium in WCCM18. Therefore, it will include a review of the computational strategies applied to pediatric care: from fluid dynamic models applied to the identification of the best surgeries to correct congenital heart defect, to biomechanical computational approaches to assess growth in children, to numerical models of fetal development, to simulations of pediatric medical device treatments. The outcome of this minisymposium will be a productive gathering of minds, where experts from different areas of pediatric computational mechanics will gather together and exchange thoughts on strategies to overcome the challenges of this area of study and ideas to further the application of computational mechanics as a clinical tool for pediatric medicine. A Special Issue has also been agreed with the Journal of Medical Engineering & Physics, Elsevier, as part of the minisymposia in WCCB: $https://tinyurl.com/pediatricmedicine/$. Acknowledgements: This work is supported in part from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 749185.